SKULL MORPHOMETRICS OF *LASIORHINUS LATIFRONS* (OWEN 1845) (MARSUPIALIA: VOMBATIDAE)

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Skull morphometrics do not support the splitting of *L. latifrons* into two subspecies, one at each end of its geographic range. Measurements of wombat skulls from the Blanchetown region in the east of South Australia to Nullarbor Station, approximately 1000 km to the west, do not show any clinal variation. Analysis of wombat measurements from intermediate geographic locations show little variation of the homogeneity within *L. latifrons* over its entire geographic range.

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South Australian hairy-nosed wombat taxonomy began in 1845, when Owen (1845) exhibited the skull of a wombat at a meeting of the Zoological Society of London. He named the new species *Phascolomys latifrons*. Owen (1849) gave a more detailed account in the Society's transactions of 1849, but the wombat's external anatomy remained unknown. Twelve years later Angas (1861) suggested a conspecificity between Owen's species and a wombat at that time living in the Adelaide Zoo. This suggestion was rejected by Gray (1863) because Owen had based his description of *P. latifrons* on a single skull. Gray subsequently created a new species, *P. angassii*, for the Adelaide Zoo wombat. Gray (1863) also rejected Gould's (1863) published plates of what he thought Owen's *P. latifrons* might look like based on a large common wombat skin sent to the British Museum from South Australia. Gray named the skin *P. setosus*. Subsequently Gould (1863) named the hairy-nosed species, featured in another of his plates, *P. lasiorhinus*. Gray (1863) also disagreed with Gould's *P. lasiorhinus* for he added the name *Lasiorhinus m'coyi* to the taxonomic miasma. South Australian hairy-nosed wombat taxonomy was finally resolved when the skull of the animal described by Angas (1861) was shown to be a specimen of *P. latifrons* Owen (Murie 1867).

A distinction between the hairy-nosed wombat and the common wombat was made by Wood Jones (1924) who split the genus *Phascolomys* into *Lasiorhinus* Gray 1863, the hairy-nosed wombat, and *Vombatus* Geoffroy 1803, the common wombat, on the basis of skeletal and external differences.

South Australian hairy-nosed wombat taxonomy was resurrected over a century later when Crowcroft (1967) hinted that there might be more than one subspecies of *L. latifrons*, one at each end of its known geographic range i.e. Portee in the east, and Nullarbor Station in the west. Although presenting an important zoogeographic question, no attempt has since been made to resolve Crowcroft's observation.

MATERIALS AND METHODS

Specimens

Skulls of *Lasiorhinus latifrons* from their entire geographic range in South and Western Australia were examined in the collections of the South Australian Museum and British Museum (Natural History). Additional specimens were collected at Blanchetown, Roonka and Swan Reach in South Australia.

Measurements

Although both adult and juvenile specimens were examined for this study, osteological measurements were made, by vernier calipers, on adults only i.e. on skulls in which all cranial sutures were closed, and all teeth fully erupted.

Skull Measurements

1. Skull length; distance from the most rostral point of the incisive bones to the most caudal point of the parietal bones.
2. Bitemporal breadth; distance across the temporal bones, rostral to the mastoid process and caudal to the squamous root of the zygomatic.
3. Frontal length; measured along the midline from the frontonasal suture to the coronal suture.
4. Bimalar breadth; distance across the malar bones opposite the maxilloincisive suture.
5. Nasal length; distance along the midline from the most rostral point of the nasals to their junction with the frontonasal suture.

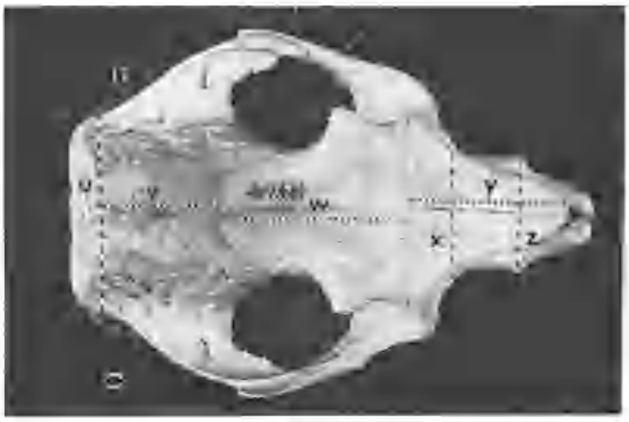

FIGURE 1. Some of the skull measurements used on the skulls of *L. latifrons*. This specimen was collected from Kyancutta, S.A. u, bitemporal breadth; v, length from the coronal suture to the lambdoidal suture; w, frontal length; x, bimalar breadth; y, nasal length; z, bi-incisive breadth.

6. Bi-incisive breadth; distance between the nares.
7. Bizygomatic breadth; distance across the skull between the lateral surfaces of the zygomatic bones.
8. Combined upper incisor alveolar breadth.
9. Upper diastema length.
10. Mandible length; distance from the most rostral point of the incisor alveoli to the most caudal point of the condyloid process.

Osteological terminology used is as in the 'Nomina Anatomica Veterinaria' (Habel *et al.* 1983).

Analysis

Student's *t*-test, 2-'sided' and bivariate regression analysis (Simpson *et al.* 1960), and Coefficient of Difference analysis (Mayr 1969) were used. As bivariate regression analysis showed no significant sexual dimorphism for any skull character, measurements of both sexes were combined.

Systematics

Lasiorhinus latifrons (Owen 1845)

1845 *Phascolomys latifrons* Owen. South Australia.
1863 *Phascolomys angassii* Gray. South Australia.
1863 *Phascolomys lasiorhinus* Gould. South Australia.
1863 *Lasiorhinus m'coyi* Gray. South Australia.

Holotype

Lasiorhinus latifrons, British Museum number 46.338, skull, subadult. South Australia. No specific location given.

Description

Cranium: frontals long; nasals short with straight tips; nasals bend before rostral surface of incisives; incisive process reduced to a tubercle; frontonasal suture has a rostrocaudal amplitude of 0.5–1.0 mm; cranial vault is convex; occiput at the nuchal crest is concave; there is no parietal pit; there is no process on the medial surface of the mandibular fossa.

Mandible: articular surface is short and does not overhang the inflected angle; rostral origin of the ascending ramus is opposite the third and fourth molar teeth; condyloid processs has a deep fossa on the rostral surface; masseteric fossa is shallow.

Dentition: premaxillary incisor, occlusal surface is short. Mandibular incisor, occlusal surface is elongate. Maxillary premolar, occlusal surface is elongate, there is a longitudinal mesiolingual groove approximately 1 mm wide. Mandibular premolar, occlusal surface is quadrate. Mandibular molars, have a shallow groove on the distal surface of the 1st molar and mesiovestibular surface of the 2nd, 3rd and 4th molars.

Distribution

The specimens were grouped on their geographic origin as coming from eastern, central and western regions. The eastern region included specimens from the Murray Valley and Yorke Peninsula. The central region had specimens from Eyre Peninsula and west of Lake Harris to Fowlers Bay. The western region consisted of specimens from Yalata to Caiguna extending north to the Transcontinental Railway (Marlow 1965, Lowry 1967, Wells 1968, Conquest 1969, Aitken 1971, McIlroy 1973).

Analysis

Metric differences

Pooled measurements for wombats from their eastern distribution differ from those from their western distribution. Using mean and range values in millimetres they are on average larger in skull length: 163.3 (149.6–175.6) *v.* 162.4 (150.5–175.7) and frontal length 63.0 (58.6–68.9) *v.* 59.9 (58.4–61.5).

Their mean values show their bimalar breadth to be 47.9 (41.5–54.0) *v.* 51.2 (45.6–55.9), bitemporal breadth 64.2 (57.2–70.7) *v.* 72.7 (67.5–78.3), bi-incisive breadth 38.3 (33.9–41.8) *v.* 39.2 (37.7–41.0), upper diastema length 38.3 (34.5–43.5) *v.* 39.7 (35.5–43.7) and mandible length 120.4 (111.2–128.7) *v.* 122.1 (113.2–129.0). The means of eastern wombats are all smaller.

Bivariate regression

On the basis of cranial characters (Figs 3–4), Nullarbor wombats generally have mean values larger than those of the eastern animals for bitemporal breadth relative to skull length.

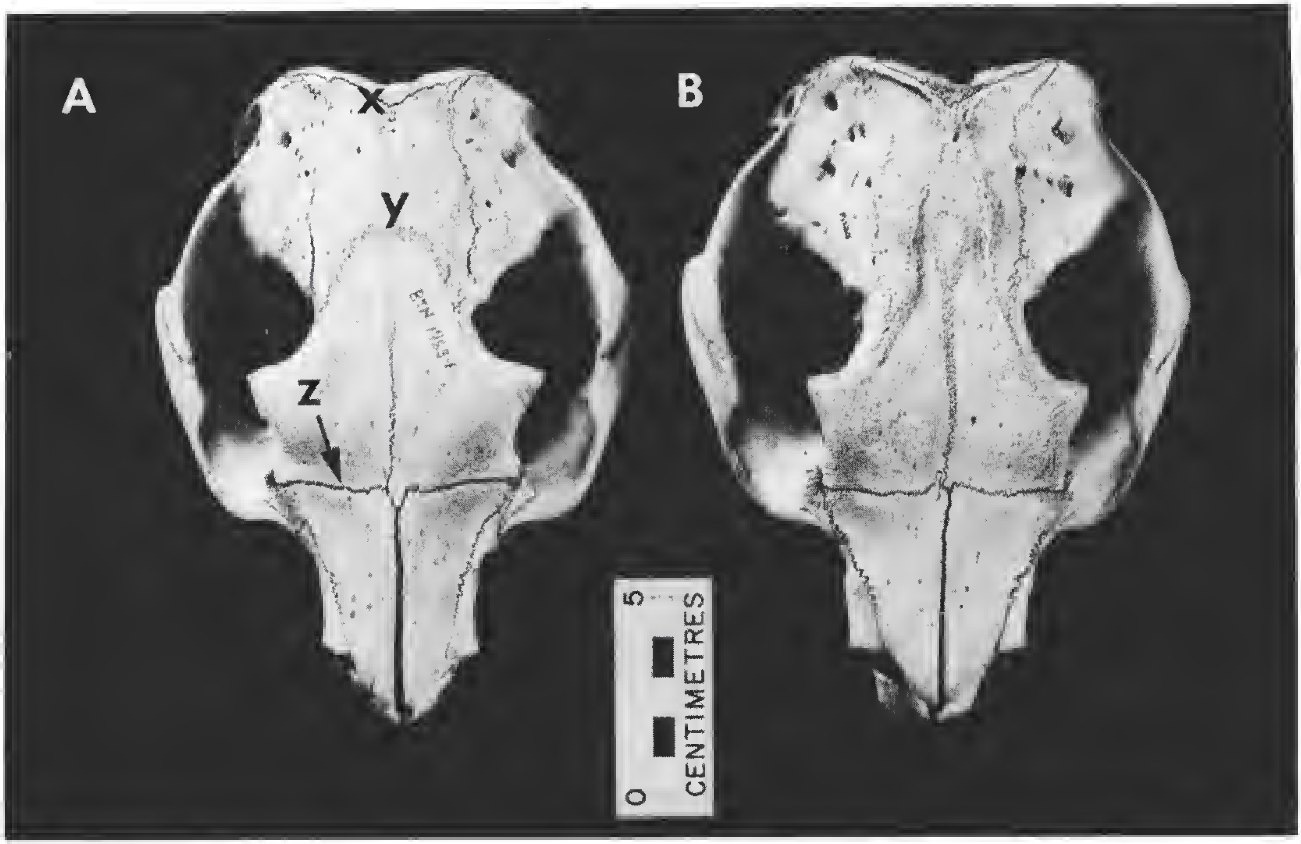

FIGURE 2. Dorsal view of the cranium of male *L. latifrons* from (A) Blanchetown, and (B) Nullarbor Station. x, nuchal crest; y, cranial vault; z, arrowed, frontonasal suture.

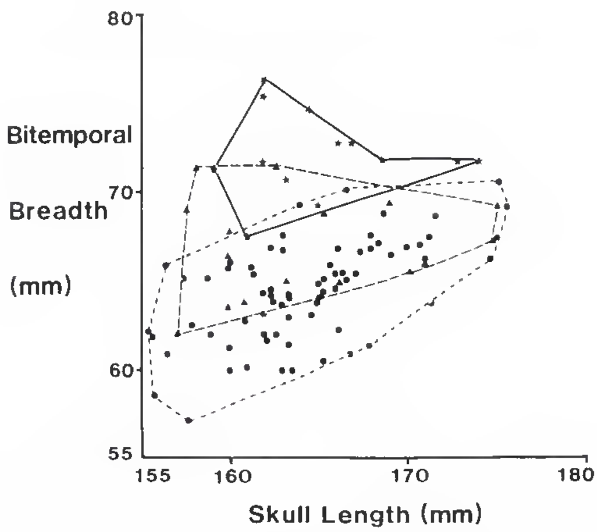

FIGURE 3. Bitemporal breadth relative to skull length of adult specimens of *L. latifrons*. (--●--), *L. latifrons* from locations at the eastern end of their range; (-▲-) from Yardea; (-★-) from the western end of their range.

Morphological differences

Frontonasal sutures are directed rostrally into the nasals in wombats from their eastern distribution, but are directed caudally into the frontals in wombats from their western distribution. Additionally in the eastern wombats the nuchal crest at its midsagittal region is slightly concave cf. deeply concave. Also the nuchal crest is level with parietals cf. raised above parietals.

Discussion

Although Crowcroft (1967) was able to distinguish Portee wombat crania from those from Nullarbor Station, and the present authors could in many instances separate the two populations by the shape of the cranial vault, these features were found to be unreliable as diagnostic characters. Indeed, this study found that approximately 23% of crania examined from their eastern distribution could be confused with those from their western distribution when using the frontonasal suture direction characteristic. There was also a 30% error when cranial vault shape was used.

Although the morphological differences are sufficiently great to invoke Mayr's (1969) 75% Rule, under which a population is deemed to be a subspecies when 75% of its members are distinguishable from all members of a previously recognised population, data from the few available wombat crania collected from their central distribution show intermediate features suggesting that the splitting of *L. latifrons* into two subspecies is premature.

Clinal variation is suggested by the gradual

TABLE 1. Skull measurements of adult *Lasiorhinus latifrons*. Values are in millimetres.
a, Mt Gambier; b, Portee, Blanchetown, Roonka and Swan Reach; c, Yorke Peninsula; d, Eyre Peninsula; e, Yardea; f, Fowler's Bay; g, Great Australian Bight; h, Nullarbor Station.

Geographic location		a	b	c	d	e	f	g	h
Skull length	n	1	80	4	2	20	—	1	53
	$\bar{x}$	163.4	163.3	162.0	174.9	161.3	—	163.1	162.4
	sd	0.00	5.87	2.50	0.00	6.35	—	0.00	5.78
Bimalar breadth	n	1	77	3	2	16	1	1	14
	$\bar{x}$	54.3	47.9	46.5	47	50.9	51.8	52.7	51.2
	sd	0.00	3.11	1.32	0.00	2.81	0.00	0.00	2.91
Bizygomatic breadth	n	1	76	3	1	20	1	1	52
	$\bar{x}$	116.8	120.2	114.9	130.7	120.4	128.3	126.0	120.4
	sd	0.00	4.34	4.95	0.00	6.11	0.00	0.00	4.64
Bitemporal breadth	n	1	77	4	2	16	—	1	13
	$\bar{x}$	64.1	64.2	62.8	68.4	66.2	—	70.7	72.7
	sd	0.00	2.86	1.51	0.00	3.57	—	0.00	2.88
Bi-incisive breadth	n	1	78	4	2	16	1	1	14
	$\bar{x}$	38.8	38.3	37.6	39.7	40.4	39.8	40.1	39.2
	sd	0.00	1.85	1.87	0.00	1.42	0.00	0.00	1.13
Nasal length	n	—	5	—	—	—	—	—	—
	$\bar{x}$	—	56.4	—	—	—	—	—	—
	sd	—	3.91	—	—	—	—	—	—
Frontal length	n	1	26	2	—	—	—	1	3
	$\bar{x}$	67.4	63.0	59.0	—	—	—	58.4	59.9
	sd	0.00	2.77	0.00	—	—	—	0.00	1.55
Combined upper incisor breadth	n	—	15	—	—	—	—	1	1
	$\bar{x}$	—	23.9	—	—	—	—	24.6	25.1
	sd	—	1.01	—	—	—	—	0.00	0.00
Upper diastema length	n	1	71	4	2	16	1	1	14
	$\bar{x}$	40.1	38.3	38.8	43.1	38.2	42.4	40.0	39.7
	sd	0.00	2.03	0.76	0.00	1.39	0.00	0.00	2.3
Mandible length	n	1	67	3	2	16	1	—	14
	$\bar{x}$	121.00	120.4	119.4	131.8	120.5	122.8	—	122.1
	sd	0.00	3.96	1.28	0.00	4.07	0.00	—	4.63

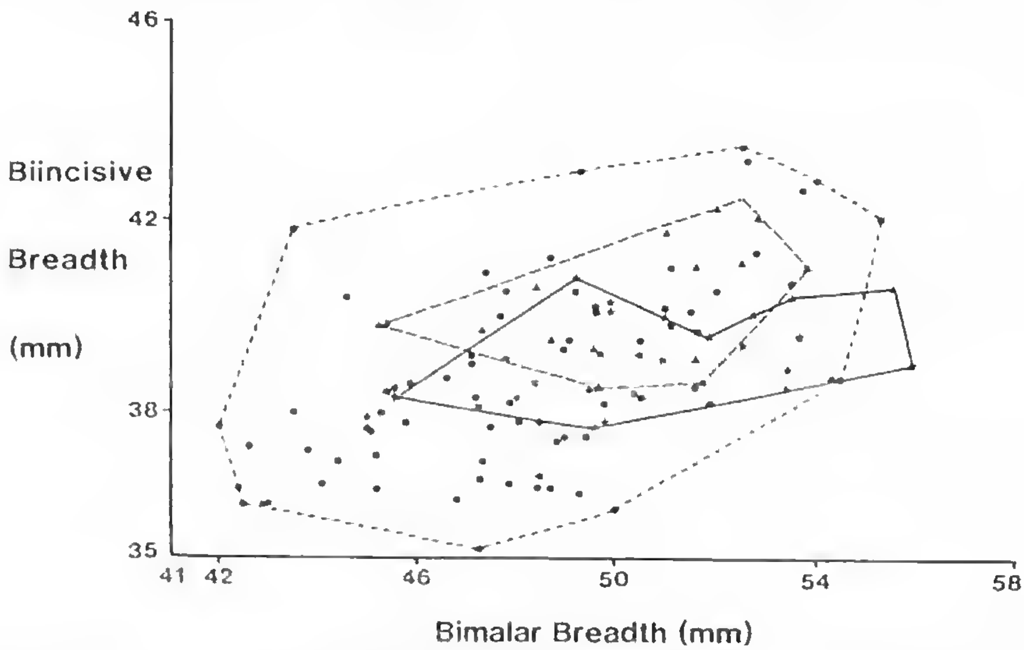

FIGURE 4. Bi-incisive breadth relative to bimalar breadth of adult specimens of *L. latifrons*. (--●--), *L. latifrons* from locations at the eastern end of their range; (-▲-) from Yardea; (-★-) from the western end of their range.

change in frontonasal suture shape and orientation. It is generally directed rostrally into the nasals in wombats from the eastern regions of their range; straight across the nasals in those from their central distribution; and directed caudally into the frontals in animals from the western reaches of their range (Crowcroft 1967). However, there is much variability evident within the entire wombat distribution.

Analysis of the available data for *L. latifrons* show the species to be morphologically homogeneous over the extent of its geographic range. This conclusion, however, does not exclude the possibility of genetic drift, hence morphological divergence occurring within, and between, the various disjunct populations.

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